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Computer Simulation of Podiatry Clinic at Charette Health Care Center

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Abstract

The simulation project is about evaluating the direct effects of support services to the podiatry service that will be provided by Orthopaedic department at Charette Health Care Center. The new facility, the Tricare guidelines, and the consolidation of support services at the new facility present an opportunity clouded by the many uncertainties brought about by change.

The simulation used data collected from the Orthopaedic department to run a model of the department at the new facility. In addition to applying the current practice at a new facility, two new radiological suites within the departmental spaces were added, exclusively for the use of the Orthopaedic department. Since Podiatry has to co-exist with the other orthopaedic subspecialty clinics and share common support, the simulation also included the general processes in the other subspecialty clinics.

Three scenarios were used to evaluate the effect of support services. Two support areas proved to be adversely affecting the efficiency of the department to provide outpatient services. Patient's total time in the clinic was excessive. As certain variables and processes were changed in the simulation, a direct correlation between the support services and the total patient time emerged.

The Orthopaedic department has to start planning the implementation of change to maintain or improve the quality of patient care, as perceived by the patients, at the new health care center. As the planning progresses, changes in the processes, number of resources, and patient scheduling can be evaluated with the use of a computer simulation program.

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Introduction

The Podiatry clinic, one of the eight subspecialties of the Orthopaedic department at the Naval Medical Center Portsmouth (NMCP), is scheduled to move into the new Charette Health Care Center. This move is anticipated to occur in the spring of 1999, and along with other ambulatory clinics of NMCP, the Orthopaedic department, and its support personnel will step into a 21st century facilities design with the most up-to-date technology in medical care and communications. While the long awaited move is fast approaching, there is another important change that will have a considerable impact on all military treatment facilities (MTFs) in the Tidewater area. That change is the managed care contract with Anthem Alliance. This contract will affect the way medical resources are managed in the area. It will also apply a considerable influence on how medical services are apportioned among beneficiaries residing within NMCP's catchment area. Some of the contract's stipulations can directly affect the MTFs' flexibility in managing or providing health care. One of the most notable changes introduced by the contract is the importance of Primary Care Managers (PCMs). Referrals will now have to be strictly routed through and closely managed by the PCM. Along with these restrictions, the contract also brings some opportunities for MTFs in the Tidewater area such as resource sharing agreements. The overall effect of the move into the new health care center and the necessity to streamline health care delivery practices can at times become so magnanimous that it can be very difficult to comprehend or evaluate. The changes can be so overwhelming that they can result in a perceived uncertainty for the future which, in turn, can contribute to unnecessary apprehension, confusion, and lack of direction among the affected staff.

To get a better understanding as to what may occur in the new facility for Orthopaedics, especially for Podiatry, the researcher uses a computer program to simulate the patient processing in the new health care center. Although the emphasis of the simulation and this graduate management project is on Podiatry, it is necessary to address and simulate the other subspecialties, divisions and support activities of the Orthopaedic department. Full scope simulation is necessary since all of Orthopaedics' subspecialties will share many common support functions in the new health care center. The way one subspecialty uses a resource can affect the availability of such resource to another subspecialty within a reasonable time and at the right amount. The choice of computer program to use in the simulation project is based on the researcher's previous training and the availability of the program on a loan basis from the software developer. The software program is also one of the leading programs in the medical field and is well known and accepted in the military healthcare system.

Naval Medical Center, Portsmouth (NMCP) is the largest military treatment facility in the Hampton Roads area of Virginia. This area is known for having one of the highest concentrations of military personnel in the United States. Hampton Roads consists of Norfolk, Portsmouth, Chesapeake, Virginia Beach, Suffolk, Newport News, and Hampton. NMCP is the tertiary facility that supports Navy and Marine Corps active duty personnel and their family members from Little Creek Naval Amphibious Base, Dam Neck Fleet Training Center, Oceana Naval Air Station, Norfolk Naval Station, Norfolk Naval Shipyard, Yorktown Naval Weapons Station, Northwest Communication Facility, and various surface ships, subsurface vessels, and air squadrons of the Atlantic Fleet. In addition, NMCP supports Army, Air Force and Coast Guard beneficiaries from Langley Air Force Base, Fort Eustis, Fort Monroe, Coast Guard surface ships and other Coast Guard units within the Tidewater area. As of fiscal year 1997, the estimated eligible beneficiaries for NMCP include 89,244 active duty, 112,233 family members of active duty, 34,685 retirees, 53,124 family members of retirees, and 12,122 others for a total of 301,408. Fort Eustis has a total beneficiary of 49,421, while Langley Air Force Base has 54,158 (Progress Report, 1997). The Coast Guard has a total of 9,623 beneficiaries in the area.

In June 1990, NMCP broke ground for a $330 million major construction project to replace some of its antiquated buildings such as Building 1, which was built in 1827. Due to a lack of current space, NMCP also leases commercial clinical spaces. The new facility, which is officially called the Charette Health Care Center, is expected to be completed in September 1998 and be fully functional by the Spring of 1999. This new facility will have about 1.02 million square feet, 336 inpatient beds, 17 operating rooms, and more than 300 outpatient examination rooms (Naval Medical Center Portsmouth, 1998). The new facility will also have the state of the art design and equipage to meet the changing health care needs of beneficiaries. The Orthopaedic department's space in the new health care center will be expanded. The total of its examination rooms will expand from 16 to 23, its treatment rooms from one to five, its minor operating rooms from one to two, and will have its own two radiology suites (Deafenbaugh, 1997).

The Podiatry division has two full-time Podiatrists on staff. The Division Officer is a Lieutenant Commander in the Medical Service Corps, and the other staff member is a civilian under a personal service contract that started in fiscal year 1997. Prior to having the personal service contract, Naval Medical Center Portsmouth purchased Podiatry services for active duty personnel from the civilian community through the command's supplemental care program.

According to NMCP's Patient Administration Department Report for Supplemental Care dated October 16, 1997, in fiscal year

1996, there was a total of 1,101 active duty patients referred for supplemental podiatry care at a cost of $182,710.77. The type of purchased visits that fiscal year included treatment for ingrown toenails, bunions, heel pain, foot drop, callus, corns, and many other types of foot and ankle medical problems. By dividing the total cost of supplemental care for podiatry in fiscal year 1996 by the number of patients treated, the average cost per patient turned out to be $165.95. Since the Department of Defense's cost accounting called Medical Expense and Performance Reporting System (MEPRS) keeps track of the number of visits vice number of patients for ambulatory care, a direct comparison in terms of cost cannot be made between civilian and MTF provided outpatient podiatry care. MEPRS data provided by the Data Quality and Analysis Department of NMCP on April 1, 1998 indicate that the average cost of podiatry outpatient visit in fiscal year 1997 was $73.00, and the average cost per admission for podiatry services was $1,633.00.

The Tricare contract for Region Two was awarded on September 15, 1997 to Anthem Alliance. This managed care contract will affect beneficiaries located in the catchment areas of the Naval Medical Center Portsmouth, Fort Eustis, Langley Air Force Base, Fort Lee, Naval Hospital Cherry Point, Naval Hospital Camp Lejeune, Seymore Johnson Air Force Base, Fort Bragg, and Pope Air Force Base (Tricare, 1997). There are 733,751 total eligible beneficiaries in Region Two. The Tricare concept requires military treatment facilities to abide by certain qualitative and quantitative guidelines that are also applicable to the contractor's network providers. Eligible beneficiaries, other than active duty personnel, shall have three options under the Tricare concept. The Tricare Prime, for which all active duty service members are enrolled, employs a closed Health Maintenance Organization (HMO) concept; the Tricare Extra uses a Preferred Provider Organization (PPO) concept; and the Tricare Standard uses the traditional Fee-for-Service concept which is similar to the old Civilian Health and Medical Program of Uniform Services (CHAMPUS) method of payment. The Tricare concept allows military treatment facilities (MTFs) to enter into memoranda-of-agreements to enhance MTFs' capabilities to provide care under a resource sharing program. NMCP is anticipated to enroll 89,875 active duty (Progress Report, 1997) and 100,567 other eligible beneficiaries (Deafenbaugh, 1997) under Tricare Prime. NMCP will be significantly responsible for each of the enrollee's health care. In addition, NMCP will provide specialty services on space available basis to 112,052 more beneficiaries projected to be using either Tricare Standard or Extra, or Tricare Prime beneficiaries enrolled with civilian contractors. The most notable Department of Defense guidelines applicable to the simulation project are the requirements for specialty outpatient care clinics appointments, length of wait, and travel time. According to the Tricare guidelines, patients enrolled in Tricare

Prime are guaranteed access to specialty care clinics located within one hour driving distance from their place of residence, receive appointments within 30 days of being selected for care, and incur no more than 30 minutes waiting to be seen by a practitioner during an appointed visit (Yakshaw, 1997). Shortcomings encountered while meeting these guidelines could trigger a process by which MTFs will have to purchase services from civilian treatment facilities to comply with the access time requirements.

The Podiatry services' staffing was designed using guidelines as set by military and civil service staffing rules and regulations. Various staffing studies, such as the Efficiency Review, are updated periodically for any staffing changes involving military and civilian billets. As stipulated in the Tricare concept, MTFs have the flexibility to pursue resource sharing agreements for augmenting MTF personnel. Through this avenue, MTFs have the opportunity to fine-tune operations by having a staffing mix that could provide the most efficient and effective medical care. It is notable that current trends in the health care industry include extensive use of physician extenders to increase access and to reduce costs. If this trend holds true and is implemented in MTFs, considerable increase in productivity can be realized. According to the two staff podiatrists in Orthopaedics, a well-trained physician assistant, with appropriate supervision from a podiatrist, could be as productive as a podiatrist.

The availability of the new health care center, inception of Tricare, and opportunities offered by resource sharing agreements, present a new environment that allow improving or expanding podiatry services. Before the Orthopaedic department capitalizes on this new environment, it has to determine its capabilities at the new health care center. It has to make sure that it can maintain the present level of operations with the current resources at the new facility before committing to an unsustainable growth. For evaluating the capability to maintain current operating levels at a future site, a computer simulation can be used. Simulation helps pinpoint problems, provides a "what-if" analysis, and discovers limitations of a system in a very controlled way (Hashimoto & Bell, 1996). The Tricare concept's requirement for convenient and timely access to care will present a considerable amount of pressure to provide more appointments designed to accommodate new patients. Consequently, delays in follow-up visits may occur and affect the quality of care as perceived by treated patients. An evaluation of an increase in productivity also includes support personnel and processes, such as front desk, hospital corpsmen, cast room technicians, and radiological support. As the clinic attempts to increase this productivity, undesirable patient waiting times can occur in these support areas. A simulation can be used to evaluate this effect by using different variables such as patient load and mix (Kalton, et al., 1997).

Statement of the Problem or Question

Can the Orthopaedic department maintain the current level of podiatry services within the guidelines of the Tricare concept at the new facility by using current resources? Since there are many variables external to podiatry services that affect the effectiveness of podiatry, it is necessary to include the other subspecialties of Orthopaedics within the same simulation. By simulating all of the other services, a realistic look and analysis of common shared resources, such as check in and check out areas, primary and radiology waiting rooms, and radiology suites, can be accomplished. Can the current waiting period of 57 minutes be reduced through some changes in the processes involved with the patient flow, or by altering the patient appointment schedules?

There is a demand for podiatry services that is not being met by the podiatry clinic at NMCP. Currently, NMCP provides podiatry services only to active duty service members stationed in the Tidewater area. CHAMPUS eligible patients are all referred to the civilian health care providers and are either funded through the use of government funds, personal funds in the form of deductibles and co-payments, and the patients' other health care insurance. As of May 1, 1998, NMCP will start paying for podiatry service for active duty family members who are enrolled in NMCP's Tricare Prime. To get an idea about the extent of purchased podiatry services in NMCP's catchment area, the researcher utilized a report from the Retrospective Case-Mix Analysis System (RCMAS). RCMAS reflects health care services obtained through CHAMPUS financing. On April 6, 1998 a report for fiscal year 1997 was generated through RCMAS detailing the number of episodes, the total amount billed, the total amount allowed, total government paid, total patient paid, and total other health insurance paid for 53 Current Procedural Terminology (CPT) codes that are applicable to podiatry outpatient services. The report was restricted to the beneficiaries in NMCP's catchment area. The report also excluded claims that are still pending or in process. Out of the 53 CPT codes in the report, 17 were used to sample the CHAMPUS cost for podiatry services in NMCP's catchment area. It is very likely that the other 36 CPT codes were also used for podiatry services, but for the purpose of this graduate management project, they were omitted. Examples of the 36 CPT codes that were not included are Removal of Nail Plate, Repair of Ankle Ligament, X-Ray Exam of Foot, and Exploration of Ankle Joint. The amount spent on the 13 CPT codes listed below indicates that there is a substantial financial outlay for podiatry services among non-active duty patients who are beneficiaries of NMCP. The difference between the amount allowed of $578,257, and the $460,558 that was paid for by the government, was either paid for by the beneficiaries, or by the beneficiaries' other health insurance.

Table 1

CHAMPUS Payment Data on Related Podiatry Services

Procedure	Amount Billed	Amount Allowed	Government Paid
Repair of Ankle Ligament	54,397	10,649	8,776
Excision of Foot Lesion	30,960	13,081	8,758
Removal of Foot Lesion	147,589	52,240	42,810
Removal of Ankle/Heel Lesion	5,837	3,395	2,607
Removal of Heel Bone	7,453	2,770	520
Partial Removal of Toe	180,959	63,504	44,221
Repair of Foot tendon	4,287	1,850	1,796
Repair of Hammertoe	224,034	68,932	52,762
Correction of Bunion	807,641	294,216	243,934
Incision of Heel Bone	55,847	12,758	10,267
Application of Paste Boot	31,477	12,511	9,719
Removal of Foot Lesion	13,373	4,452	4,161
Partial Removal of Foot Bone	31,103	9,031	6,715
Removal of Toe	12,910	3,155	2,613
Revision of Foot Tendon	43,160	16,825	13,898
Fusion of Foot Bones	27,021	5,626	5,372
Fusion of Big Toe Joint	11,694	3,262	1,629
Totals	$1,689,742	$578,257	$460,558

Literature Review

It is estimated that about 19 percent of the United States population get an average of 1.4 foot problems per year; five percent of the same population experience foot infections which include athlete's foot, other fungal infections and warts every year; five percent have ingrown toenail problems each year; five percent have corns or calluses each year; and about 6 percent of the same population experience foot injuries, bunions, and flat feet every year (Foot Facts). About 82 percent of corn and calluses, 65 percent of the toenail problems, 63 percent of the bunion problems, and 46 percent of flat feet of fallen arches problems are treated by podiatric physicians (Foot Facts).

Podiatrists are the health care professionals trained to take care of feet medical problems. To be a Podiatrist, one must have an undergraduate degree (Bachelor of Arts or Sciences) and have an additional four years of training at a United States college of podiatric medicine (Kosinski, 1990). The first two years of training in podiatry include courses in biochemistry, physiology, histology, neurology, internal medicine, dermatology and anesthesiology. The last two years of the four-year training are used for clinical training with a concentration on the lower extremities. The Doctor of Podiatric Medicine (DPM) degree is granted after the completion of the four years of training and passing parts 1 and 2 of the National Board Examinations. There are currently about 10,700 doctors of podiatric medicine actively practicing in the United States. The current ratio of podiatric physician in the United States is one for every 24,624 people (Foot Facts).

Although orthopedic physicians can provide some of the required foot care, the podiatrict physician is found to be more economical and tends to treat patients in an outpatient setting (Weiner, 1987). At the Naval Medical Center Portsmouth, 22 of the 59 ICD-9-CM diagnoses associated with foot problems can be treated by an orthopedic physician (Spada, 1998). Common diagnoses for which the podiatrists at NMCP exclusively treat include bacterial infection, benign neoplasm (soft tissue), bursitis (foot/ankle/heel), contact dermatitis, contusion, diabetis mellitus, diabetic with ulcer, foreign body, ganglion cyst, unspecified gout, acquired hammer toe, soft corn, sweaty feet, hard callus, inclusion cyst, ingrown nail, inversion sprain ankle, metatarsus adductus, metatarsus primus varus, neuroma/metatarsalgia, onychomycosis, parathesia, paronychiitis of toe, peripheral angiopathy, resplanus, plantar fasciitis/fibroma, post operative infection, sesamoiditis, soft tissue mass, tendonitis tibialis, ankle/foot tenosynovitis, tinea pedis, ulcer of lower limbs, verruca plantaris and wound dehiscence (Spada, 1998).

The use of computer simulation in the health care industry has taken a greater importance throughout the 1980's and 1990's. This proliferation may be attributed to the availability of personal computers with commercial simulation software programs and the quest for more efficient and higher quality patient care (Benneyan, 1997). Simulations are very effective in testing different proposed process scenarios, staffing, scheduling, and space allocations (Cirillo & Wise, 1996). Simulation of such scenarios and allocations allows an organization to evaluate effectiveness without subjecting staff and patients to undue burden and confusion. A proposed facility can be evaluated for its usefulness by simulating with the use of historical data

(Levy, et al., 1989). By using historical data, a simulation model, which is a detailed scaled down imitation of a system, can replicate events at a compressed time to draw some conclusions as to what may happen at a longer given period of time. There are numerous pitfalls that could setback a simulation project (Benneyan, 1997), some of which include: unclear problem statement and objective; decision makers not sincerely involved with the simulation project; inaccurate understanding of the processes involved; missing relevant dependencies and relationships among events and entities involved; unnecessary amounts of details; inaccurate identification of randomness in the system being simulated; use of inappropriate distributions; arbitrary use of means vice variability and properly identified distributions; too much animation; and absence of verification and validation. By following methodical stages, some of these pitfalls are avoided. There are five basic steps that can be used for simulating a reengineering endeavor (Huebner & Miller, 1996). These steps include enlightenment and organization which cover selection of key players to assist in the simulation project, and identification of the objectives. After the organization stage, the exploration and discovery stage is initiated to identify processes and collect appropriate data for the simulation. The third stage is the innovation and creation which include simulating different scenarios to determine the best operation to meet the objectives. The implementation and adjustment stage is the realignment of resources, events and tasks of the simulation model and the actual use of improved processes as identified in the simulation. The final stage is the maintenance and improvement that involves fine-tuning the model and the actual processes being used.

There are also three main non-technical reasons why simulation fails (Keller, et al., 1991). First and foremost is salesmanship. Before a simulation project can be started, many players within the organization have to be convinced that the project is really worthwhile. In addition to the decision-makers who may have to approve use of funds, there are line managers who may be skeptical about a thorough review of their operations. As such, the project officer has to be skillful in selling the idea of simulation by use of examples, selection of key and proper audience, and effectively articulating the benefits of simulation. The educational background of the project officer is also crucial for the success of the simulation. Adequate exposure to statistics, experimental design, logic, and thorough knowledge of the process or product involved in the project will immensely enhance the success of the project. Moreover, the educational background fosters trust and confidence of those who will use the information generated by a simulation project. Lastly, the project should be given enough time to complete. Simulation is a very complex process that requires an appropriate amount of time. Every step, from data collection through the final implementation or recommendation, requires care and appropriate thoroughness. Arbitrary use of inappropriate short cuts or inadequate iterations could easily undermine the validity of the project's findings which may hamper the ability of the simulation to mimic actual occurrences.

Purpose of the Study

The purpose of the study is to determine how podiatry services are affected by the common service support areas such as the front desk, radiology and cast room services. By simulating the operations in the new facility with planned space allocations and support services such as radiology, and cast rooms, the growth potential for podiatry can be evaluated. Since there are some major changes on how the Orthopaedic department plans to operate in the yet unused new facility, many relationships and processes can only be evaluated by the use of a computer with a modeling software program. By using a computer simulation, possible choke points such as the front desk, radiology and cast rooms can be evaluated. Another big concern for the Orthopaedic department is the lack of waiting rooms that are co-located with the subspecialty clinics. It is uncertain how a centralized waiting room, with a centralized front desk, can meet the needs of the Orthopaedic department in terms of patient flow, accessibility to the examination rooms, and entry and exit services to the patients.

Methods and Procedures

With assistance from the researcher's preceptor, enough support was mustered for the project. The Deputy Commander, Director for Surgical Services, and Orthopaedic Department Head welcomed the project and believed in its merits. The researcher was then allowed to interface directly with departmental personnel. The Orthopaedic department's administrative officer provided all the necessary support for the project and acted as the liaison between the researcher and the physicians in the department. The administrative officer also provided guidance on the collection of data and clarifications on the processes involved in routing the patients within the clinic.

The researcher used a methodology outlined in an article published in The Healthcare Information and Management Systems Society (Cirillo & Wise, 1996). This methodology was chosen for its simplicity, completeness, and in its detailed guideline in breaking down complex projects, such as computer simulations. The steps that used in the simulation project are as follows:

a. Understanding the Goal. In the early stages of the project, the researcher sought an ideal objective of maximizing the productivity of the entire Orthopaedic department. As data became available and certain realities became known, such as the uncertainty or the ever-changing number of specialists under training or the number of staff under a teaching capacity, the researcher decided to streamline the objective. The goal was narrowed down to the Podiatry services at the new facility. The choice of Podiatry was much more appealing, as the initial data collected indicated an extraordinary amount of patient waiting time to see the Podiatrists. Also, Podiatry's staffing is more static. While there is a fluctuating number of staff, residents and interns in the different subspecialties of Orthopaedics, Podiatry constantly employs only staff personnel. As the project evolved, the more attainable goal of determining the effect of support services to podiatry services at the new facility was pursued. Although this goal is still broad and it involves testing more than one variable in the simulation, the project is able to explore other possibilities of attaining the goal. Specifically, variables such as the number of examination or treatment rooms, number of hospital corpsmen assigned to Podiatry, and Orthopaedics common support personnel, such as the front desk, radiology, and cast room, were used to evaluate the effective flow of patients in the Podiatry and other subspecialty clinics.

b. Understanding the Current Process. To understand the process in place and the anticipated or planned process in the new facility, the researcher interviewed the Podiatry Division Officer, Orthopaedic department's administrator, front desk personnel, Leading Petty Officers and the Leading Chief Petty Officer. The interview's goal was to determine how patients are routed through the different parts of the clinic, how different types of clinicians interact with the patient, and the contributing roles of support personnel. Through these encounters and actual observations of the clinic, the researcher was able to plot patient flow within the clinic. This flow was refined with considerable assistance from highly dedicated hospital corpsmen responsible for the efficient movement of patients within the clinics. The flow diagrams attached as Appendices A and B describe the complexities of operating varying types of subspecialties within one clinic. Although some other variables may not have been included in the flow diagram, the major processes were accurately depicted.

c. Map a New Process. The new facility, by design, will necessitate changes in the processes used in servicing patients within Orthopaedic department. The flow of patients has to be drastically changed to minimize confusion and unwanted traffic within the hallways of the treatment areas. The biggest changes presented in the new clinical area are the absence of waiting areas within close proximity to the subspecialty clinics, and the availability of two radiological suites for the exclusive use of the Orthopaedic department. Since there is a moratorium of one year wherein no changes can be made in the new facility, the department must find ways to work around the limitations of the facility. When the simulation was first run using the current method of moving patients from the waiting area to the examination rooms, considerable amount of time spent by clinicians traversing the hallways in the new facility became very evident. The animation available from the software program had an indispensable contribution in getting a bird's eye view of the entire clinic. With the help of the software program, two other methods of moving patients within the clinic were evaluated. The method used in the final simulation appears to be the most efficient in terms of patient travel time, minimizing unwanted traffic, and minimizing clinicians' travel time. The preferred method of moving patients from the waiting area involves a hospital corpsman, dedicated to the subspecialty clinic, picking up patient record at the front desk and escorting the patient. This method is now in use at the current facility for Total Joints and Sports clinics. This change in the new facility should increase the clinicians' available time for patient care in the Podiatry, Hand, Pediatrics, and Acute clinics. In addition to escorting patients in the new facility, the hospital corpsman will also be utilized to prepare patients in the examination room. The flow chart, marked as Appendix C, depicts the planned processes that will be instituted in the new facility.

d. Conceptualization. Charette Health Care Center presents many opportunities to improve the overall service provided by Orthopaedics. The availability of more physician offices and examination rooms allow some variations in the provider to examination room ratios that could certainly increase the clinic's efficiency. With increased number of treatment/examination rooms and the availability of resource sharing under the new Tricare managed contract, additional possibilities in improving patient care are now in the horizon. For Podiatry, the increase in examination rooms has a tremendous impact on its efficiency and productivity. In the current facility, each podiatrist is assigned one office which is also used as an examination room. The podiatrists also call on and escort their patients from the waiting area to their office or the cast room. The clinical layout of the new facility requires that some changes have to be made. The three check in and check out areas that are currently in the department have to be consolidated due to design constraints. In the new facility, there is only one area that is feasible for check in, and another area for check out. There will also be two radiological suites, and a large recovery room. The radiological suites will be using digital radiography that will eliminate the time needed to develop x-rays; thereby, reducing the current amount of time spent by patients in radiology by half.

e. Sizing the Model. Even though this project is focused on podiatry, it is necessary to include the other subspecialties of the Orthopaedic department because of the way they share resources. If podiatry is a stand-alone clinic, simulating the processes that are involved only with podiatry can be appropriate. But since each subspecialty clinic can and does affect the timing and the availability of resources to the other subspecialties, a simulation to include all subspecialties becomes essential. The resulting simulation is able to identify system problems that have direct impact upon podiatry patients. Although the model includes all the subspecialties, there are some processes and variables that are excluded from the simulation. The utility of simulating all the details involved in operating the clinic has become questionable as the model became more complex. Some of the occurrences that are not simulated are repetitive trips to radiology, selection of new cases among the physicians, scheduling all patients to the staff physicians and none to residents, case studies, the fluctuating order of cast and radiology services, and the varying patient mix in the daily schedule templates. The simulation has to be limited to the busiest day of the week, rather than running the simulation for an entire week, or on the extreme side, for an entire month. Each day, a different set of subspecialty clinics is operating an outpatient clinic, and the patient mix seen by subspecialty clinics varies each outpatient day. To focus on podiatry, while representing the overall effects of the other subspecialties, the model represents podiatry's user distributions to be distinct from the other clinics'. There are areas where the distributions for the Hand, Pediatrics, and Acute are also singled out due to the uniqueness of some of their processes. The distributions in the model are determined from the data collected, Orthopaedic department's scheduling templates, and input from the department's administrative officer. The detail of the simulation is deemed sufficient by the researcher and the clinic's administrator to mimic the overall process that are expected to occur within the Orthopaedic department at the new health care center. Since the main focus of the simulation is in podiatry, this portion of the model has more details than the other clinics. An example of additional detail is each provider's appointment template being represented in the simulation. The first podiatrist's schedule for a Tuesday is varied than the second podiatrist whose patients on Tuesdays are all coming for post-operative visits.

f. Build a Skeleton Model. The model is built in stages as recommended by the software developer, MedModel. To accurately represent Orthopaedic department's spaces in the new facility, the researcher used a blueprint from the Medical Construction Liaison responsible for the department's spaces. In addition to the blueprint, the researcher also toured the new facility to become acquainted with the clinic's layout. The facility layout has been established in the model as a background graphic placed behind the grids to avoid accidental erasures or unwanted editing. After the background layout was established, the entities, resources, routing paths, locations, attributes, variables, distributions, and arrival cycles were added. The initial model simulates a simple movement of a patient entity from the entrance to the front desk, waiting area, examination room, check out area and finally to the exit. Dummy times have been used as service times in the appropriate areas. Although very simple in nature, the skeleton model has assisted in developing enthusiasm among some Orthopaedic department personnel who assisted in the data collection. The skeleton eventually grew to include all subspecialties, radiological suites, and the use of many variables to mimic appointment types and clinical providers.

g. Data Gathering. The initial data gathering for the entire clinic lasted for one week. The form used to collect the data is attached as Appendix D. As stated earlier in this report, the initial data indicated that patient waiting time for podiatry services was longer compared with the entire clinic. The mean waiting time for podiatry was 57 minutes whereas, the other subspecialties' combined mean waiting time was only 26 minutes.

h. Finalize Initial Model. The model was finalized using distribution tables established from the data collected from Orthopaedic department. Due to the staffing simplicity of Podiatry and Acute care clinics, distributions for both clinics were extracted from the data gathered. All the other clinics' data were consolidated to form generic distributions for types of visits and length of services. The department's administrator provided the ratios of patients acquiring radiological and cast services. The original scenario of using front desk personnel to deliver records to clinical cluster rooms, and physicians escorting patients from the waiting area was changed when it became evident that too much time was wasted traversing the hallways. Instead, a hospital corpsman was assigned to each clinic to prepare rooms and patients. The clinic hospital corpsman is stationed in the clinic's hallway to monitor movement of patients and the availability of examination rooms and clinicians. For simulation purposes, the patients returning from radiology or cast room are assigned to a queue area right outside the clinics' cluster rooms. Cluster rooms are designated for the exclusive use of physicians and are used for reviewing cases, and conferring among the staff and resident physicians.

Parameters Used in the Model

a. Timing of the Simulation. Due to a rotation in the use of operating rooms, the different subspecialties in Orthopaedics stager their clinical time to see new, follow up, pre-operative and post-operative patients. Based on their schedule, the busiest day of the week for Orthopaedic department is on Túesdays when Hand, Podiatry, Trauma, Sports, Acute, Pediatrics, and General Orthopaedic subspecialty clinics are seeing outpatients. For simulation purposes, Tuesday was selected to test the capability of support resources in maintaining the flow of patients and providing support services such as front desk, radiology and cast. The researcher and the department's administrative officer conclude that if support personnel are able to successfully accommodate the busiest day of the week, the other days can be accommodated as well.

b. Locations. There are two sets of entrances and exits to cover both sides of the main patient waiting area. The main patient waiting area has a capacity of 55 patients and/or escorts. This capacity is based on the number of seats that will be placed in the actual waiting area of Orthopaedic department at the new facility. The front desk queue line has an infinite capacity, whereas the front desk service point can service two patients at a time. Two separate locations are also established for medical records. The different clinics that are in the simulation are listed below along with their capacity, color code and the number of offices, examination rooms, or cluster rooms. Only offices that are planned to accommodate patients are represented below. As indicated in the earlier paragraphs, a cluster room is where staff personnel and residents or interns spend time together to discuss cases. The radiology suites have a waiting area for four patients. An overflow is designated in the scrub area, right across the radiology waiting room. Radiology has two x-ray units.

Table 2

Summary of Clinics Simulated

Clinic	Examination Room	Cluster Room	Office	Color Code
Podiatry	2		2	Green
Sports	7	2		Orange
Hand	5	1		Pink
General Ortho	2			Brown
Acute	4	1		Red
Trauma	4	1		Blue
Pediatrics	3	1		Purple

c. Entities. The patients and medical charts are the two entities used in the model. Entities are those which receive services in the model and drive the use and movements of the resources. The patients and charts are subdivided by clinical appointment categories, and for ease of identification, have been color-coded the same as the clinic that they are visiting. The number and the frequency of patients arriving are determined by the clinics' appointment templates.

d. Resources. The resources in the model are the staff, residents, interns, Hospital Corpsmen (HM) at the front desk and the various subspecialty clinics, Radiology Technicians, and Cast Room Hospital Corpsmen. There are two HMs at the check in area and one at the check out counter. These HMs are used by the entities for information, follow up appointments, record retrieval, and general guidance in the clinic. The subspecialty HMs are used to pick up records at the front desk, escort patients from the main waiting area to the examination rooms, and prepare the patients for the physicians. In addition to taking x-rays, the two Radiology Technicians are used to escort patients from the x-ray waiting room to the x-ray tables. Cast Room Technicians are used for general casting and bandaging services. Staff, Residents and Interns, and the two podiatrists are the primary health care providers in the model.

e. Variables. Certain variables are set up to collect data and to assign certain identification numbers to all patients. The variable used to count the number of patients in the clinic is named vPt_in_Clinic and to count the number of patients in the main waiting area, the variable vPt_in Waiting_Room is used. The vPtNumber assigns a unique identification number to patients.

f. Distribution. User distributions are established to represent the data set collected from the Orthopaedic department and the input from the administrative officer. The d(Name of Subspecialty)_Appt_Type contains the distribution of patients on the four established types of patient visits - new, follow up, pre-operative, and post-operative. The d(Name of Subspecialty)_Provider is the distribution of patients among the different types of clinical providers within the different subspecialty clinics. In the Acute clinic, all patients are seen by

Interns and are eventually seen by a Resident assigned to the clinic. In podiatry, there are two different types of patient entities vice having one type of entity distributed to the number of podiatrists. The d(Name of Subspecialty)_Rad_(Type of Appointment) represents the percentage of patients, under the different types of visits, who require x-rays. Since there is a considerable difference in the amount of x-rays taken for the Hand and Pediatrics patients, both clinics are separated from the "All Others" category. The d(Name of Subspecialty)_Cast_(Type of Appointment) represents those who need to be serviced by the Cast Room Technicians. The summary of the distributions for Tuesdays is illustrated on the following tables.

Table 3

Distribution of Appointment Type

Subspecialty	New Patient	Follow Up	Pre-Operative	Post-Operative
Podiatry (Spada)	36%	64%		
Podiatry (Hall)				100%
Sports	32%	47%	9%	12%
Hand	38%	47%		15%
General Ortho	58%	42%		
Acute	48%	38%	7%	7%
Trauma	40%	60%		
Pediatrics	24%	76%		

Table 4

Distribution of Clinical Provider Seen

Patient Type	Staff Physician	Resident Physician	Intern	Podiatrist 1	Podiatrist 2
Podiatry (Spada)				100%	
Podiatry (Hall)					100%
Sports	50%	50%			
Hand	35%	65%			
General Ortho	100%				
Acute			100%		
Trauma	50%	50%			
Pediatrics	50%	50%			

Table 5

Radiological Service Requirements by Appointment Type

Subspecialty	New	Follow Up	Pre-Operative	Post-Operative
Podiatry	80%	5%	85%	85%
Hand	95%	60%	60%	80%
Pediatrics	80%	50%	5%	5%
All Others	75%	45%	20%	45%

Table 6

Cast Service Requirements by Appointment Type

Subspecialty	New	Follow Up	Pre-Operative	Post-Operative
Podiatry	20%	20%	0	100%
All Others	30%	30%		

g. Attributes. Attributes in the subject model are assigned to the patients to identify certain characteristics or categories. As patients enter and move within the clinics, attributes are assigned and, in some cases, also change as the patients move from one location to another.

The attributes with corresponding purposes that are listed below are used in the simulation model.

Table 7

List of Attributes Used in the Simulation

Attribute	Purpose
aPt_(Name of Clinic)_Provider	Identify the type of clinician to be seen
a(Name of Clinic)_Appt_Type	Identify the type of outpatient visit
a(Name of Clinic)_Rad	Identify those who need radiology services
a(Name of Clinic)_Cast	Identify those who need cast room services
axray	Mark those who received radiology services
acast	Mark those who received cast room services
acastFirst	Identify those who go directly to the cast room from the waiting area
aRad_Return	Mark those who can leave the clinic after receiving radiology services
aReturn_Wait	Mark those who have to return to the main waiting area after receiving radiology services
aTrauma	Mark those who need to be on wheelchairs
aAcute	Mark those who need to be on gurneys

h. Arrival Cycles. Arrival cycles are established for each of the seven groups of patients seen at the subspecialty clinics that are included in the model. Arrival for podiatry patients is further subdivided between the two staff podiatrists. These cycles are based on the current appointment templates for a normal Tuesday. There are some Tuesdays wherein certain subspecialty clinic may schedule special types of patients (i.e., infections, medical boards). The arrival cycles are set to accommodate quantities rather than percentages to closely resemble the actual template schedule. The arrivals are also scheduled to the closest 15 minutes increments starting at 0730.

Processing Used in the Model

As the patient enters the clinic, attributes identifying the type of visit and the provider to be seen are assigned to the patient. These attributes are driven by the distribution for "Type of Appointment" and "Type of Provider Visited". In addition to the attributes, the patient also increases the variable that keeps track of the number of patients currently in the clinic. The patient goes to the "check in queue" and takes a turn to be serviced by the front desk Hospital Corpsman. The patient spends about two minutes with the front desk. A medical chart is created by the patient to simulate the retrieval or making of the record by the Hospital Corpsman. The record created is exclusively assigned to the patient and is color-coded to match the color of the clinic being visited by the patient. The patient sits at the main waiting room while the medical chart is placed in the chart queue for pick up by the clinic Hospital Corpsmen. A patient requiring radiological service, prior to being seen by a clinician, is routed through radiology and returns to the main waiting room. The patient waits until the room assigned is available and then moves with the clinic Hospital Corpsman (HM). The patient and the chart are then joined together in the assigned examination room. If a patient is routed directly to the cast room, the patient and the chart are joined in the cast room queue line. The HM spends about 15 seconds to prepare the patient for the clinician and then leaves. The patient gets the appropriate provider and uses this resource up until the assigned amount of time as stated in the user distribution for "Physician Contact Time". While the patient is being seen by the clinician, the attributes for x-ray and cast rooms are determined based on distributions for "Radiological Service Requirement by Appointment Types" and "Cast Service Requirements by Appointment Types". If the patient is identified as needing radiology and cast services, it goes to radiology first. A patient not needing radiology or cast service is routed directly to the check out queue line.

A patient requiring radiology service proceeds to the x-ray waiting area where it waits to be escorted by the radiology technician to an x-ray table. At the x-ray table, the patient uses the radiology technician for ten minutes. On the way out, the patient receives another attribute to indicate that the patient has received radiology service. The patient then goes to the clinic queue area to see its original provider. To mimic reality, a patient in the clinic queue area is given priority for the use of examination rooms and clinicians. In the examination room, the patient uses the provider for five minutes and proceeds either to the cast room, if a cast is called for, or to the check out queue line. From the cast room queue, the patient is escorted by a cast room technician. The patient uses the cast room technician for 15 minutes, receives an attribute to indicate that cast service has been received, and proceeds to see the original provider for a five-minute check.

When the patient is finished at the examination room, it goes to the check out queue. At the check out queue, the patient waits to see the check out Hospital Corpsman. The check out process lasts for about two minutes. The check out process mimics the issuance of follow up appointments, return of records and receipt of further instructions or clarifications.

Model's Shortcomings

There are many more processes or variations of the process that actually occur within the clinics that are excluded in the model. The simulation included the processes that can capture the major and pertinent parts of the clinic's operations. The following variables and processes are excluded from the simulation.

a. Appointment Type Mix. The type of appointments, although standardized in the appointment template, changes in a daily basis to accommodate the true needs of the patients. In the model, appointment types from the template for Tuesday is used. As mentioned in an earlier part of this project, Tuesday has been chosen since it is the day when most of the subspecialties are having outpatient care clinics.

b. Provider Type. With the exception of Podiatry, all other subspecialty provider mix can change based on the availability of staff physicians, residents and interns. In the model, the full complement of interns and residents is used. Since one of the model's objectives is to determine the effectiveness of support services within Orthopaedic department, modeling the busiest operation with the most possible number of clinical providers, is appropriate.

c. Escorting Patients. In the model, the clinic HM escorts the patients from the main waiting area one at a time. In a real practical setting, the HM can conceivably, and will probably escort more than one patient at a time to minimize travel time, and to maximize the utility of physicians.

d. Clinic Queue. At this time, there is no designated queue area for patients returning from x-ray and cast rooms. In the model, these returning patients are placed in a queue line in the hallway. It is hoped that Orthopaedic department can find a more suitable queue area when the new facility opens. Certain type of patients in the clinic may be unable to stand for a long period of time while waiting for an examination room or clinician. As mentioned earlier, there will be a one-year moratorium against adding chairs or modifying any of the rooms in the new facility. Thus, finding an alternate waiting room, other than the main waiting room, is certainly a gargantuan challenge for Orthopaedics.

e. Arrival Cycle. The clinic's appointments are established in a way that certain types of visits are scheduled at certain times. For example, follow up visits may be scheduled only in the morning. Although the ratios of types of visits are represented in the simulation, the visits are not assigned to specific times. Rather, the model randomly distributes these visits throughout the scheduled clinic hours of operation based on the distribution established for "Type of Appointment". Walk-in patients are not represented in the simulation.

f. Validation. Since the simulation involves a function in the yet unused health care facility, only portions of the simulation can be validated. The time spent by the patients in the check in and check out areas and with the Podiatrists can be validated. The time spent in the cast room can also be validated. Since radiology in the current facility is shared with the rest of the hospital, the total time spent in radiology can not be validated with the model using dedicated radiological suites for Orthopaedic department.

Discussion

The simulation is an invaluable tool that can be used for planning the space allocation of clinical spaces within the Orthopaedic department. The very detailed background graphics of the model, with all ancillary rooms including the staff lockers, utility rooms, offices, and others has been used effectively to plan the allocation of the spaces to the eight different subspecialty clinics within the Orthopaedic department. By looking at the graphics and the movement of patients, the Orthopaedic department's administrative officer and leading chief petty officer are able to conceptualize a more practical placement of the various subspecialties so that they may interact more effectively with support personnel. The simulation also provides a glimpse on what the additional offices and examination rooms can contribute to maximizing the clinicians' productivity by reducing travel and idle times. In podiatry, the model is able to simulate the additional benefits of having additional examination rooms and offices. The model also indicates that even on the busiest outpatient clinic day, which is Tuesday, the planned allocation of space for Podiatry can accommodate one more clinician.

The simulation, by using different variables, is able to find a good balance between the demand for and the supply of support services that minimized the waiting time incurred by podiatry patients and the other subspecialties. The table below displays the results of the three scenarios used in the simulation of 277 outpatients seen at the seven subspecialty clinics on a normal Tuesday. There are many more scenarios that can be simulated to analyze different permutations of resource and patient type mixes, and patient handling processes. For the purpose of this graduate management project, the results of the three given scenarios are sufficient to demonstrate that an increase in podiatry service can be accommodated by the Orthopaedic department at the new health care center. The results of these scenarios for the other subspecialty clinics are displayed in Appendix E.

Table 8

Results of Three Scenarios for Selected Categories

Description	Scenario 1	Scenario 2	Scenario 3
Operation Time	15 hours	10 hours	9 hours
Radiology at Full Occupancy	91%	70%	83%
Check Out at Full Occupancy	38%	95%	38%
Podiatry Pt Group 1 Total Time	99 minutes	65 minutes	30 minutes
Podiatry Pt Group 1 Blocked Time	72 minutes	41 minutes	7 minutes
Podiatry Pt Group 2 Total Time	130 minutes	73 minutes	33 minutes
Podiatry Pt Group 2 Blocked Time	97 minutes	47 minutes	6 minutes

Scenario 1. In this scenario, one HM at the check out counter is assigned. The two radiology suites in the Orthopaedic department has provided all radiological support for the day. The choke points that have surfaced from this scenario are the check out area and radiology. These two choke points are the focus of the next two scenarios as some variables are changed.

Scenario 2. The operation time in this scenario has drastically changed. The 15 hours spent processing 277 outpatients has been reduced to 10 hours. In this scenario, patients needing radiology services for follow up visits and podiatry patients for post-operative visits are sent to the main radiology. This scenario requires a change in the current standard operating plans for Orthopaedics in the new facility. Although it is a requirement for most new patients to have x-rays on their first visit, a large portion of them come to the clinic without their x-rays. This ongoing concern can be attributed to the inattention of patients to the requirements for the first visit, or the lack of effort among the referring clinics or facilities. It is more attainable to have the patients show up with their x-rays during the follow up visits. The patients can be directed to have their x-rays taken for their follow up visits upon completion of their initial visits. In the case of podiatry post-operative patients, Dr Hall, the civilian staff podiatrist stated, that 99.9% of the time, patients can leave the clinic right after their x-rays are taken. Since there is no rush to see those x-rays, the patients can get their x-rays from the main radiology. Due to the compression of the operation time, it now appears in this scenario that the check out area is overburdened. The total time spent by podiatry patients in the clinic is probably acceptable at this point.

Scenario 3. In this scenario, the number of HMs working at the check out counter has been increased from one to two. As indicated by the total time spent by podiatry patients, the additional HM has a tremendous utility value to the patients. By adding one HM, the patients' total time in the clinic is reduced by more than half.

Conclusion and Recommendations

The Orthopaedic department can continue providing the current level of podiatry services at the new health care center, but the resulting patient wait will be unnecessarily excessive. Scenario 1 of the simulation indicates that 72 of the 99 minutes that podiatry patient group 1 spent at the clinic, and 97 of the 130 minutes for podiatry patient group 2, were blocked because of inadequate support in radiology and check out counter. As the process of acquiring radiology service and the addition of one HM at the front desk were incorporated in scenario 3, the total time and the blocked time for podiatry patient groups 1 and 2 improved dramatically. In scenario 3, the total patient time for group 1 declined to 30 minutes with blocked time of 7 minutes, and for patient group 2, the total time was 33 minutes with 6 minutes of blocked time. To make Orthopaedics more efficient in processing podiatry patients at the new health care center, the department has to increase the number of HMs at the check out counter and divert certain radiological requirements to main radiology.

Further improvements in the scheduling of podiatry patients for post-operative visits are possible. Currently, four patients are scheduled at the same time every 15 minutes with one podiatrist. Patients in their first two weeks of post-operative care are sent to the cast room for dressing change, and cast check or maintenance. Patients who are beyond the first two weeks of post-operative care are normally taken to the podiatrist's examination room. The podiatrist then travels between the cast room and the examination room to examine or treat the patients. Under the current patient scheduling, all post-operative patients are mixed together within the 15-minute blocks. Consequently, patients are divided between the cast room and the examination room which then result in the unnecessary travel of the podiatrist. To reduce this travel time and further maximize the podiatrist's available time for patient contact, the schedule should group post-operative patients according to their planned treatment or examination locations.

The need for radiology service can be further reduced if the patients coming for their initial outpatient visits come to the clinic with their x-rays. As indicated in Table 5, Podiatry and Pediatrics order x-rays for 80% of new patients, Hand orders 95%, and the other subspecialties order 75%. Some of these requirements may be forgone if x-rays from the referring sites are made available during the first visit. The process of acquiring x-rays from referring sites can be enhanced by the

Electronic Referral System (ERS). As a communication tool, ERS could be used to remind referring PCMs to send x-rays for the referred patient's first visit. To increase participation among referring PCMs, Orthopaedics should start monitoring referring sites and isolate those which constantly fail to forward x-rays.

Orthopoaedic department should continue exploring the merits of simulation. The department is so complex due to its many variables that constantly change. As demonstrated by the increase of one HM in scenario 3 of the simulation, a change in one part of the department can affect the entire clinical operations. Any change in the number or amount of resources should be tested in a simulation to measure the change's effect on the bottom line of ensuring access to quality patient care.

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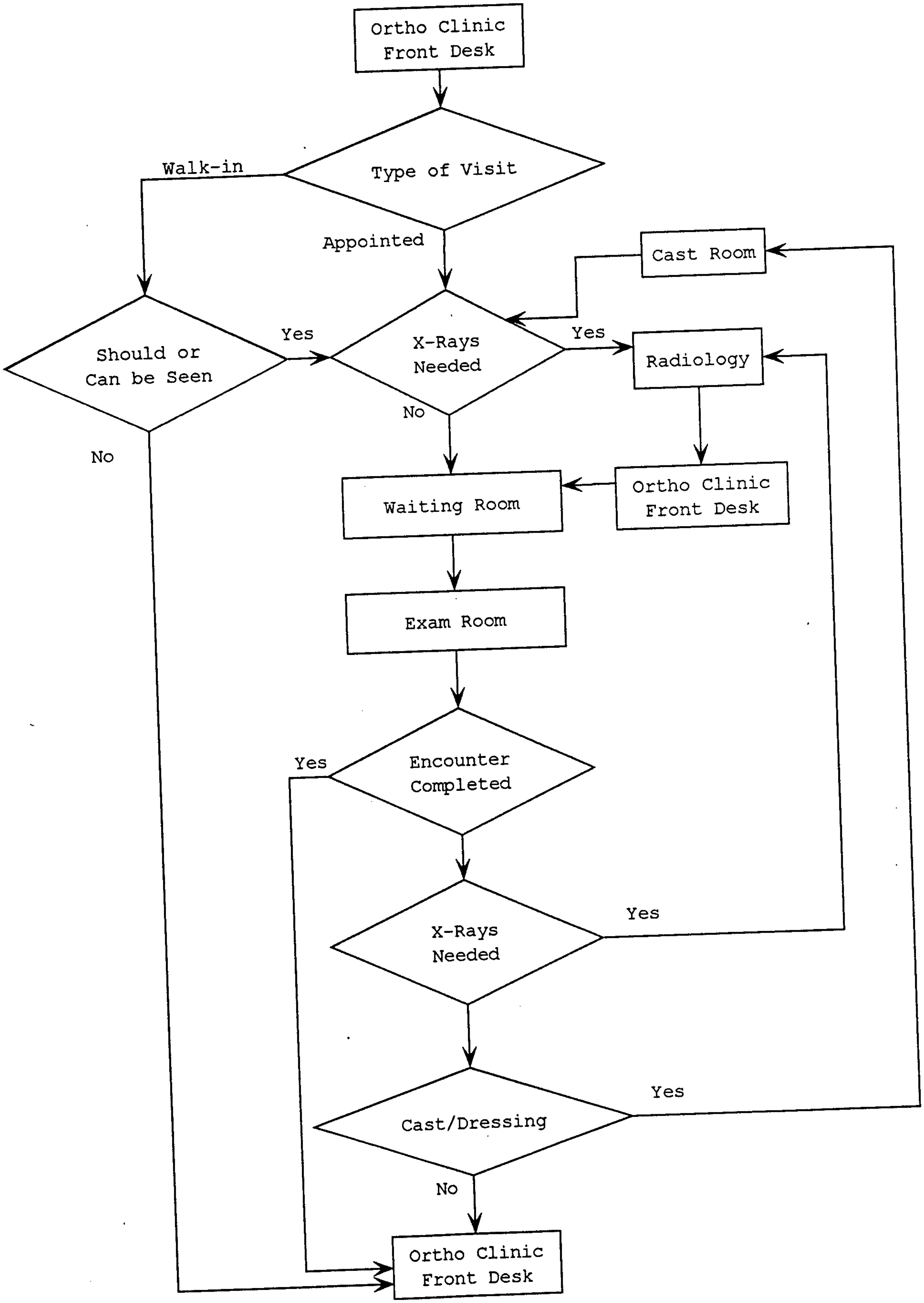
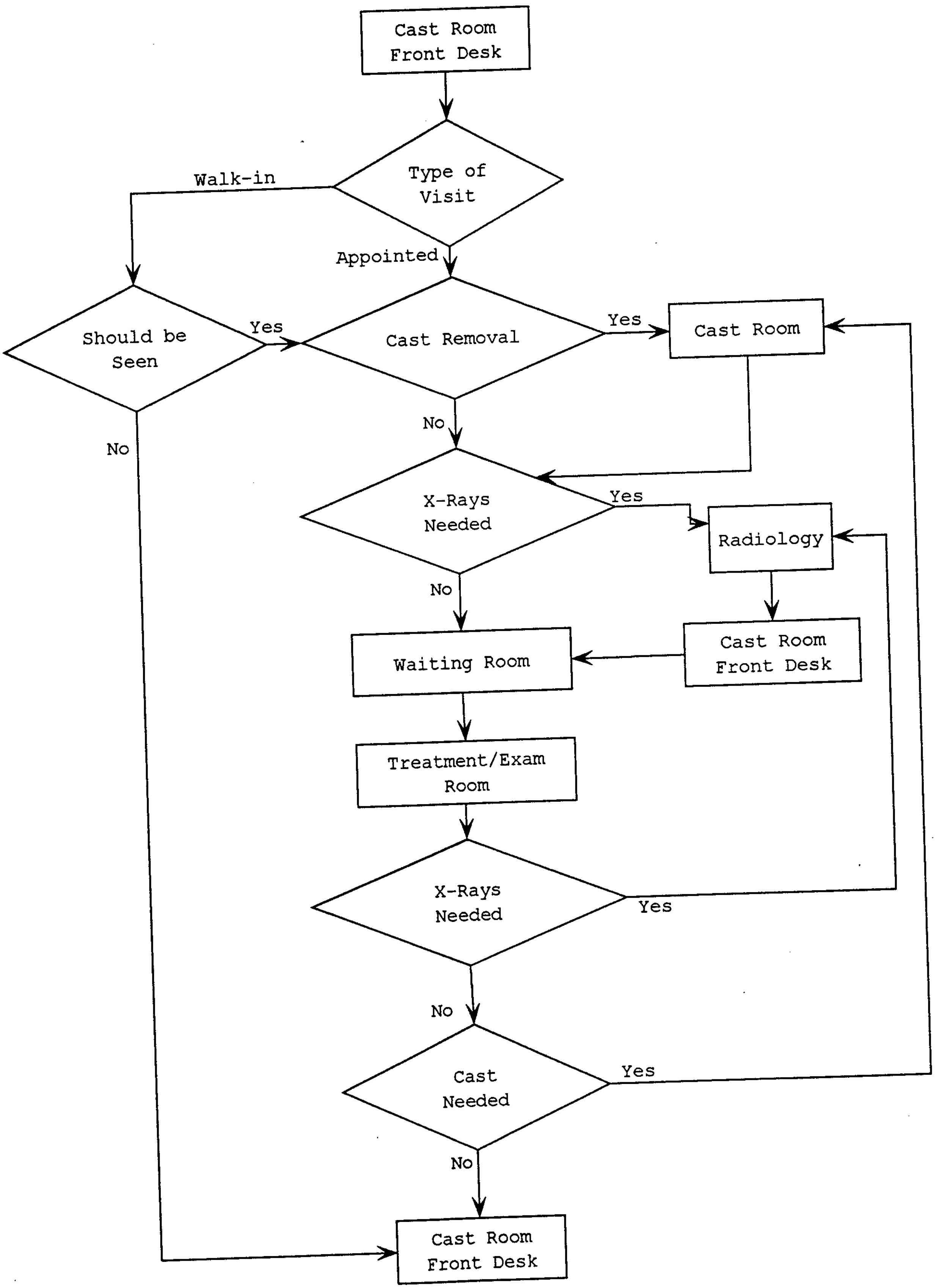
Appendix A

Spine, Podiatry, Peds, hand, Total Joint, Trauma & Sports (Outpatient Orthopaedic Department)



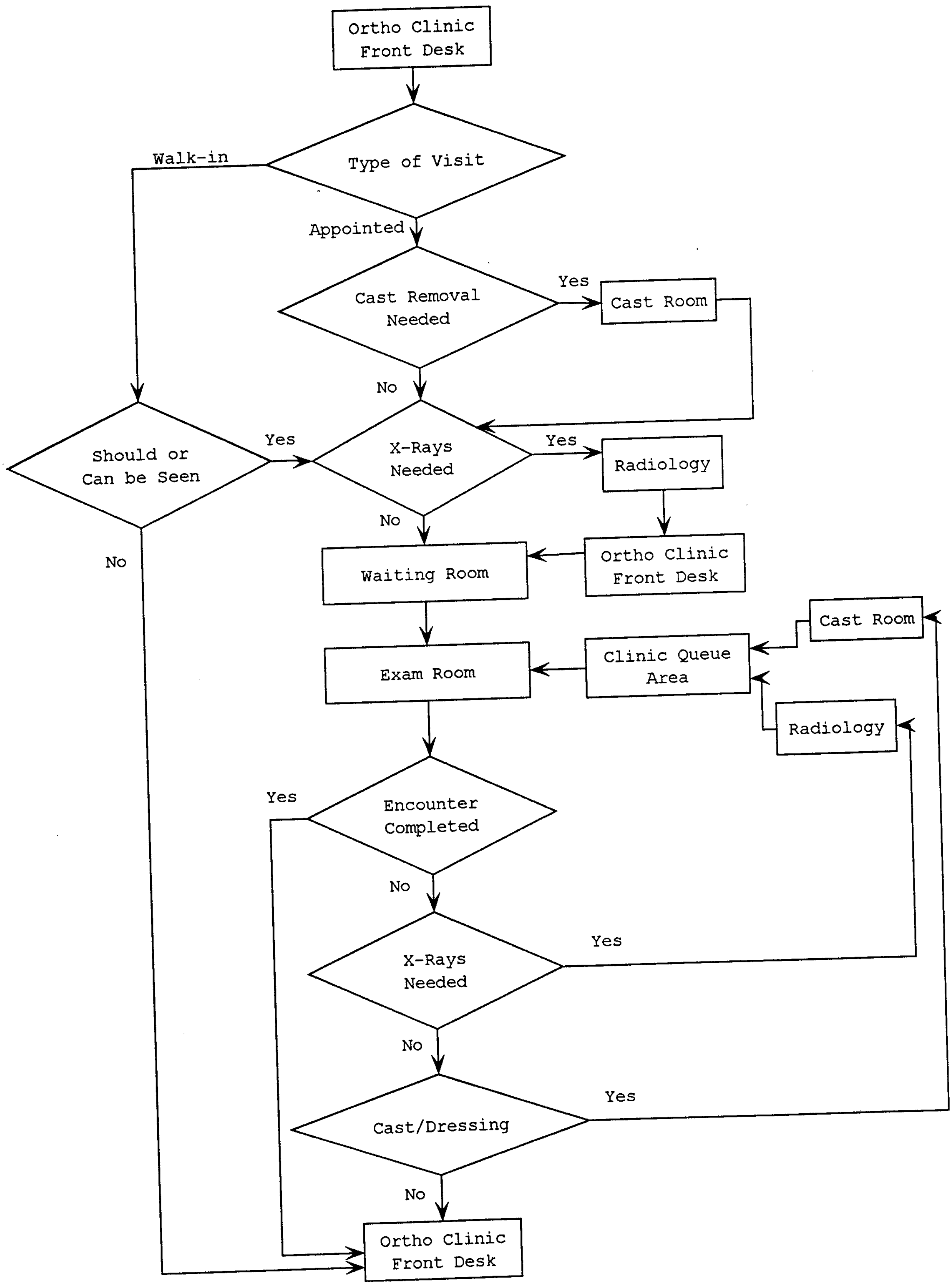
Appendix B

Cast Room
(Acute Care Clinic)



Appendix C

Orthopaedic Department
(Charette Health Care Center)



Appendix D

Orthopaedics Department

Dear Valued Patient,

Please help us enhance future service to you by filling out the requested information in this patient flow analysis. The information gathered in this analysis will be used in a computer simulation of Orthopaedics services at the new facility. Thank you for your cooperation.

Date: _________ Time: _________ Service Visited: ____________________

Patient Name: ____

Circle Reason for Visit: New Patient Follow-Up Pre-Op Post-Op

Do you have an appointment for the above visit? ____If yes, what time was your appointment? __________

Please have hospital personnel fill in the starting and ending times of your stay at the locations indicated below. *For Radiology (X-Ray), check out and in with Orthopaedics Department Front Desk who will fill in the "Start Time" and "EndTime" for Radiology. Multiple stays in any location are indicated by "First Time", "Second Time", and "Third Time" in parenthesis.*

Location	Start Time	End Time	
Front Desk (*First Time*)			**Circle any information applicable to the patient:** Ambulatory Wheel Chair Crutches Gurney # of people with the patient: 1, 2, 3
Front Desk (*Second Time*)			
Front Desk (*Third Time*)			
Trauma or Sports Patients Only: Fill in "Start Time" as soon as you pick up patients from the waiting room and the "End Time" as soon as you drop off patients at an examination or treatment room First Time Second Time			
***For Radiology (X-Ray)**, Check out with the Front Desk prior to leaving Orthopaedics and Check in with the Front Desk upon returning from Radiology.* Radiology (*First Time*) Radiology (*Second Time*)			
Other Location (*Specify*)			
Other Location (*Specify*)			
Other Location (*Specify*)			

Examination or Treatment Room

Circle Provider Type	1st Encounter		2nd Encounter		3rd Encounter	
	Start Time	End Time	Start Time	End Time	Start Time	End Time
I R S N H						
I R S N H						
I R S N H						
I R S N H						
I R S N H						

I = Intern **R** = Resident **S** = Staff Physician **N** = Nurse **H** = Hospital Corpsman

Appendix E

Results of Three Scenarios for Selected Categories

Description	Scenario 1	Scenario 2	Scenario 3
Operation Time	15 hours	10 hours	9 hours
Radiology at Full Occupancy	91%	70%	83%
Check Out at Full Occupancy	38%	95%	38%
Following Times are in Minutes			
Hand Total Time	210	93	61
Hand Blocked Time	168	54	18
Sports Total Time	175	89	54
Sports Blocked Time	129	50	12
General Ortho Total Time	124	93	50
General Ortho Blocked Time	86	58	11
Pediatrics Total Time	125	75	27
Pediatrics Blocked Time	98	48	5
Acute Total Time	159	75	28
Acute Blocked Time	126	49	5
Trauma Total Time	158	88	52
Trauma Blocked Time	115	51	13